CR-135523

U.S. Army Cold Regions Research and Engineering Laboratory
Hanover, New Hampshire 03755

ERTS-1 Project No. MMC-298

ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY

Fifth Bimonthly Progress Report

E73-11067) ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY Bimonthly Progress Report, 23 Jun. - (Army Cold Regions Research and Engineering Lab.) 5 p HC $3.00 CSCL 08E

N73-32243

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23 June 1973 - 23 August 1973

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Objectives: (Reference NASA Contract S-70253-AG dated 14 June 1972):

* Analyze and map the sediment deposition in harbors, inlets, and docking facilities in the Cook Inlet.

* Map the permafrost areas of Alaska as inferred by vegetative patterns. Compare major tonal and textural permafrost patterns with Mariner imagery.

* Correlate the snow pack cover of Caribou-Poker Creek with stream runoff.

* Map and inventory the icing on the Chena River.

* Items 2 and 4 above are to be correlated with the University of Alaska studies in the same area.

Change in Data Analysis Schedule

A six month, no cost extension was requested to continue Phase III, "Continuing Data Analysis" through a complete summer-fall season. Approval by the NASA contracting officer to extend the Phase III performance period has been received (Reference NASA-DPR dated 15 August 1973). Vegetation and permafrost terrain mapping will be expanded to include additional areas, interpretations of circulation and sediment distribution in Cook Inlet will be verified and comparisons between major tonal and textural permafrost patterns discernible on ERTS-1 imagery and terrain features visible on Mariner imagery will be made. This work is scheduled for completion by 26 January 1974.

Accomplishments:

A photomosaic of Alaska north of latitude 68° from the Canadian border to the Chukchi Sea was prepared with 17 MSS band 7 images taken in March 1973. The snow cover on the landscape enhances the topographic

relief of the region and many of the small scale depressions not normally visible are apparent. The topography on the North Slope between the White Mountains and the Titaluk River is particularly interesting because of its similarity to terrain in the northern part of Xanthe-Cryse region on Mars. This terrestrial analog is formed by thermokarst depressions which coalesce producing elongate, steep-sided valleys. This terrain is analogous to the alas topography in the Yakutian region of Siberia which is also considered a terrestrial analog of some of the Martian terrain.* A photomosaic of this Siberian thermokarst region is being prepared with 9 MSS band 7 images and preliminary interpretations are being made.

Vegetation and geologic mapping was completed in the area south of Fairbanks, Alaska. Six vegetative and geologic units were mapped in an area approximately 1600 sq. miles on an 4x enlargement of MSS band 5 image 1103-20502. This area was selected because of the availability of detailed ground truth data. These data have been correlated with our interpretations of the imagery and will be useful in the future mapping of the permafrost terrain distribution.

A brief, illustrated report of the CRREL ERTS-1 program was prepared for a Corps of Engineers Handbook on Remote Sensing. The handbook is being compiled at the Office of the Chief of Engineers in Washington, D. C. and should be published in the near future.

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*Anderson, D. M., L. W. Gatto and F. Ugolini, 1973, An examination of Mariner 6 and 7 imagery for evidence of permafrost terrain on Mars: Proceedings of the North American Contribution to the Second International Conference on Permafrost, Natl. Acad. of Sciences.

The climate conditions during the winter in the Chena River area were not favorable for the formation of large icings, therefore, preliminary interpretations have been made of the icings along many of the rivers on the Alaskan North Slope. These icings are very distinct on the late winter-spring ERTS imagery. Summer imagery has shown the changes in the icings during melting.

Work to be accomplished next reporting period:

Vegetative, geologic and permafrost terrain mapping will continue in selected areas of Alaska. Imagery of the Cook Inlet area will be analyzed and interpretations compared to earlier findings. Detailed analysis of the two terrestrial thermokarst areas considered analogous to some of the Martian terrain will continue. Because the Chena River icings are not visible on ERTS-1 imagery, consideration is being given to seeking a collaboration with University of Alaska and Canadian investigators to examine and analyze imagery of the Canning and McKenzie River areas where large icings have been observed.

Articles, papers, preprints, abstracts:

"ERTS Imagery", report submitted to OCE for publication in Remote Sensing Handbook.

"Terrestrial permafrost terrain features and Martian analogs: Comparisons between ERTS-1 and Mariner Imagery", in preparation.

Problems:

Four cycles were completed over Cook Inlet during this reporting period but only one image, with extensive cloud cover, has been received. The average cloud cover in the Anchorage area during the July-August period is 70-80%.* It is therefore, likely that cloud-free coverage for this period will be available.

*Data from National Oceanic and Atmospheric Administration, Environmental Data Service, Monthly Reports of Climatological Data: Alaska.

Recommendations: None

Changes in Standing Order Forms:

None submitted

ERTS Image Descriptor Forms:

None submitted

Data Request Forms submitted:

31 July 1973 - Bulk color prints and transparencies, 9.5 in (pending)

Data Query Forms submitted:

31 June 1973 - print out received

15 July 1973 - print out received

29 August 1973 - pending